

IN THE CLAIMS

1. (Currently Amended) A diffusion barrier layer for semiconductor devices, the diffusion barrier layer having an upper surface, and a lower surface and a central portion, and the diffusion barrier layer comprising:

silicon, carbon, nitrogen and hydrogen, with the nitrogen possessing a low dielectric constant being non-uniformly distributed throughout the diffusion barrier layer, wherein the diffusion barrier layer being between about 5 nm and about 120 nm in thickness and the central portion is substantially devoid of nitrogen.

2. (Previously Amended) The diffusion barrier layer of Claim 1 wherein the upper surface of the diffusion barrier layer is a layer which is relatively thin compared to the central portion of the diffusion barrier layer.

3. (Previously Amended) The diffusion barrier layer of Claim 1 wherein the lower surface of the diffusion barrier layer is a layer which is relatively thin compared to the central portion of the diffusion barrier layer.

4. (Original) The diffusion barrier layer of Claim 1 wherein the nitrogen is more concentrated near the lower and upper surfaces of the diffusion barrier layer compared to the central portion of the diffusion barrier layer.

5. (Original) The diffusion barrier layer of Claim 1 further comprising oxygen.

6. (Original) The diffusion barrier layer of Claim 1 wherein a portion of the carbon and the silicon in the layer is in the form of silicon carbide.

7. (Currently Amended) A semiconductor device comprising:
a substrate containing conductive elements; and
a diffusion barrier layer applied to at least a portion of the substrate in contact with the conductive metal elements, the diffusion barrier layer being between about 5 nm and about 120

nm in thickness and having an upper surface, and a lower surface and a central portion, and the diffusion barrier layer comprising silicon, carbon, nitrogen and hydrogen, with the nitrogen possessing a low dielectric constant being non-uniformly distributed throughout the diffusion barrier layer, wherein the central portion is substantially devoid of nitrogen.

8. (Previously Amended) The diffusion barrier layer of Claim 7 wherein the upper surface of the diffusion barrier layer is a layer which is relatively thin compared to the central portion of the diffusion barrier layer.

9. (Previously Amended) The diffusion barrier layer of Claim 7 wherein the lower surface of the diffusion barrier layer is a layer which is relatively thin compared to the central portion of the diffusion barrier layer.

10. (Original) The semiconductor substrate of Claim 7 wherein the nitrogen is more concentrated near the lower and upper surfaces of the diffusion barrier layer as compared to the central portion of the diffusion barrier layer.

11. (Original) The semiconductor device of Claim 7 wherein the nitrogen is distributed only in the upper surface of the diffusion barrier layer.

12. (Original) The semiconductor device of Claim 7 wherein the conductive elements are made from a metal selected from the group consisting of Ti, TiN, TiW, Ta, TaN, W, Al, Pd, Cu and combinations thereof.

13. (Original) The semiconductor device of Claim 7 wherein the conductive elements are made from Cu.

14. (Original) The semiconductor device of Claim 7 wherein the thickness of the diffusion barrier layer is from about 7 nm to about 120 nm.

15. (Original) The semiconductor device of Claim 7 wherein the thickness of the diffusion barrier layer is from about 24 nm to about 68 nm.

16. (Original) The semiconductor device of Claim 7 wherein a portion of the carbon and the silicon in the layer is in the form of silicon carbide.